

(ningxia)[Whole Home Water](#) - Low-cost, **single-point**, easy-to-install solution for whole-home water activity sensing. - Typical installations will be at an exterior hose bib, utility sink spigot or water heater drain valve. - Possible to support both identification of activity (valve open and close) at **individual** water fixtures and estimation of the amount being used. - Satisfactory accuracy. - Events occur at the same time cannot be distinguished. - Partially opened valve might be a issue.

Read other papers of [Jon Froehlich](#) and contact him.

(ningxia)[The Design and Evaluation of Prototype Eco-Feedback Displays for Fixture-Level Water Usage Data](#) **THIS paper is very important to our design**, it explores different granularity, dimensions, visualization encodings, ambient views etc. It stresses the importance of breaking down to individual fixtures. [Here is a highlighted version](#) We can use this paper as the argument that we need more detailed data. Also, the findings of this paper can be applied to energy use. Key points: - Eco-feedback designs that performed best provided multiple options (time periods, comparisons), were updated frequently (daily or more), were interactive, and/or were capable of providing detailed, appliance-specific breakdown of energy use. - Higher granular levels, with recommendations about what *actions* can be taken to reduce usage. - Self-comparison is important. For goal-setting, user control and system transparency are important. - Collaboration rather than competition. Accountability may be perceived as "blame". - For artistic ambient view: the actionability is of paramount importance. Designs need to take care not to look more visually interesting with increased consumption.

(ningxia)[The Design of Eco-Feedback Technology](#) - A limited working behavioral model: people act to maximize rewards and minimize costs -> Price may one of the techniques - Another model: altruistic values/ personal norm activation - To maximize information's transformative potential, it must be easy to understand, trusted, presented in a way that attracts attention and is remembered, and delivered as close as possible -- in **time and place** -- to relevant choice. - Goal-setting is valuable - Self-comparison is effective, but may be not when performance plateau is reached - Incentives and rewards: not necessarily financial, but most certainly can rely on game-like rewards - low/high-level feedbacks. Must contain multiple feedback options, and be interactive, user can "drill-down" into data - Techniques are effective on different levels. IMPORTANT: **Designers must think deeply about the particular behaviors they hope to change** - Two type of behaviors: 1, efficiency, one-time actions that provide a lasting impact 2, curtailment, forming new routines

(vicky)[Role of Product and System Interfaces in Designing for Zero Emission Buildings](#)

(Role of Product and System Interfaces in Designing for Zero Emission Building) -studies indicate design of product interface has strong impact on user's interacting with product. -pursuit of zero emission must consider impact of behavior as related to the interface of the energy consumption in a building. User behavior itself may considerable affect the life-cycle environmental impact of products. - three challenges in the design of interfaces aiming at enhancing energy efficiency in buildings *The mismatch between visual signals and desired behavior* -Radicals goals that represent a new perspective for solutions should be addressed in interface design to make behavior-related impacts. - Need to be taught how building system functions -Keep residents as active users *Motivation for*

individual effort Hard for operator (active user) to improve behavior patterns and system errors if information is provided for temperatures that diverge from intended level and unintended system activity. So keep interface options unfragmented, not just showing separate parts of the building.

Physical architectural language with lack explanations Conceptual model of how a naturally ventilated building works is simpler and better communicated than the automatic system (pipes) as opposed to windows. However windows don't leave much information and impact for user, challenge the natural system by introducing a steering tool for operator.

Challenges identified at different user levels First level user is defined as persons related to the building who are in control of energy and electricity consumption Feedback can contribute to changing behavior patterns by leading attention to energy consumption related to activities, time periods, and products or rooms.

Attention Management - level of abstraction -level of importance of the info and how much attention it should attract -choice of appropriate method for transition of information to mechanical solutions.

Information Visualization -can be described as visual representation of abstract data to amplify cognition and may improve appeal and understanding of the info in peripheral and direct displays at point of use. --serves to increase awareness of the relationship between individual behavior and common energy consumption in local environment.

Personalized information -Can be strong motivation to three types of feedback to increase motivation for change in behavior : comparative, historic, and normative. -Most successful solutions provide feedback frequently over a long time in an appealing manner. Give operator understanding of how system is interrelated, daily users need info and knowledge of preferable behavior and understand affects of undesired behavior on energy consumption and infer climate quality.

Keywords: Interfaces for sustainable behavior, design for real users, zero emission building, ubiquitous computing applications, distributed direct environmental sensing

(vicky)[People Garden: Creating data portraits for users](#) "We believe that these data portraits can help users to understand an interaction space, see how it changes over time, and provide a mirror for the level and nature of the interaction in that space."